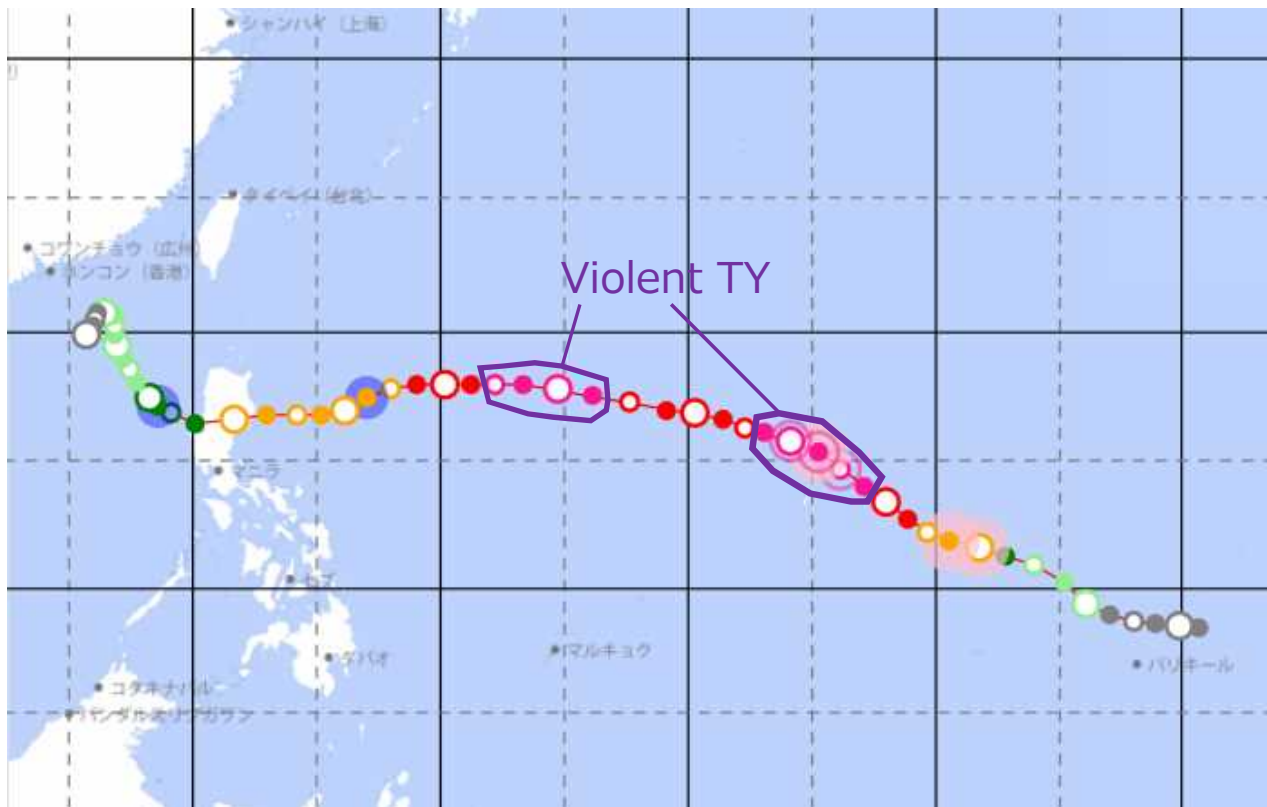


Yutu (T1826)

RSMC Tokyo - Typhoon Center
Japan Meteorological Agency

Outline of Yutu (T1826)

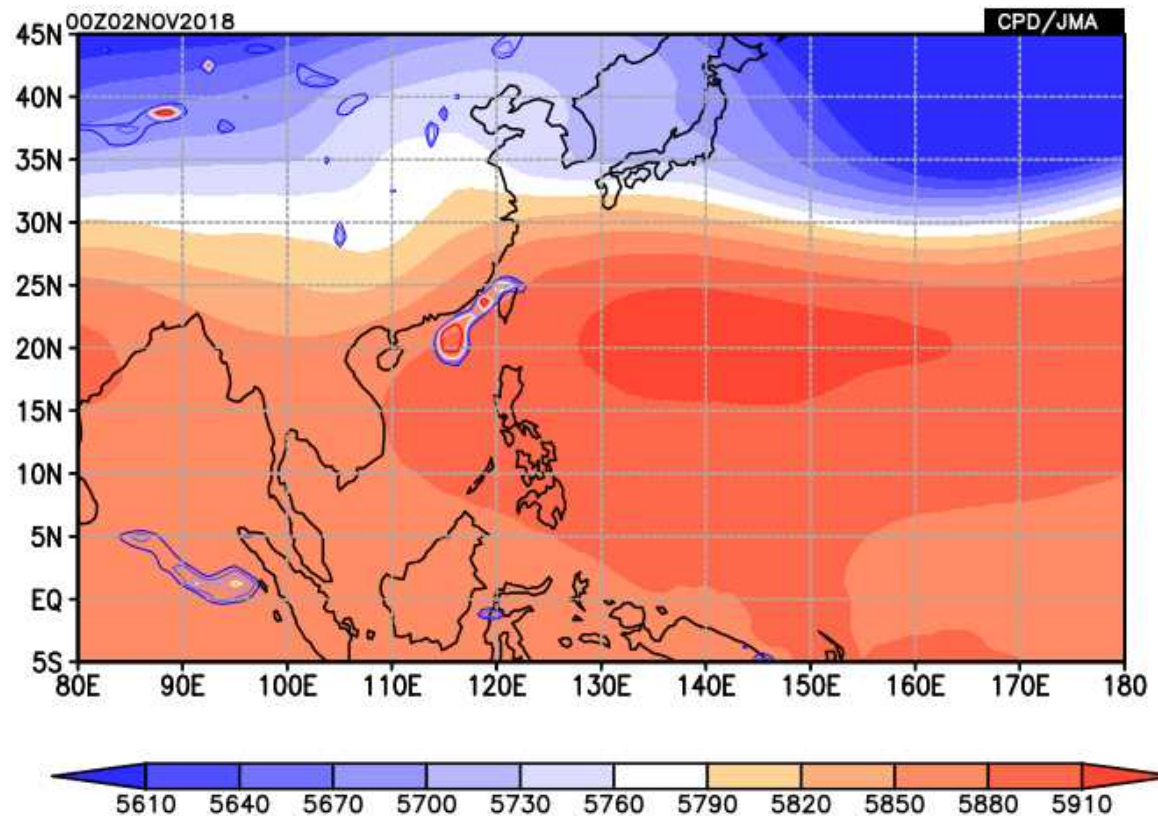


- Yutu (T1826) formed over the sea around the Marshall Islands and moved westward, causing severe damage to the Philippines.
- Its duration sustaining TS intensity or higher was 11.25 days, which was the longest in 2018.
- It was also the most developed TC in 2018, with the same intensity of 115kt and 900hPa as Kong-rey (T1825).

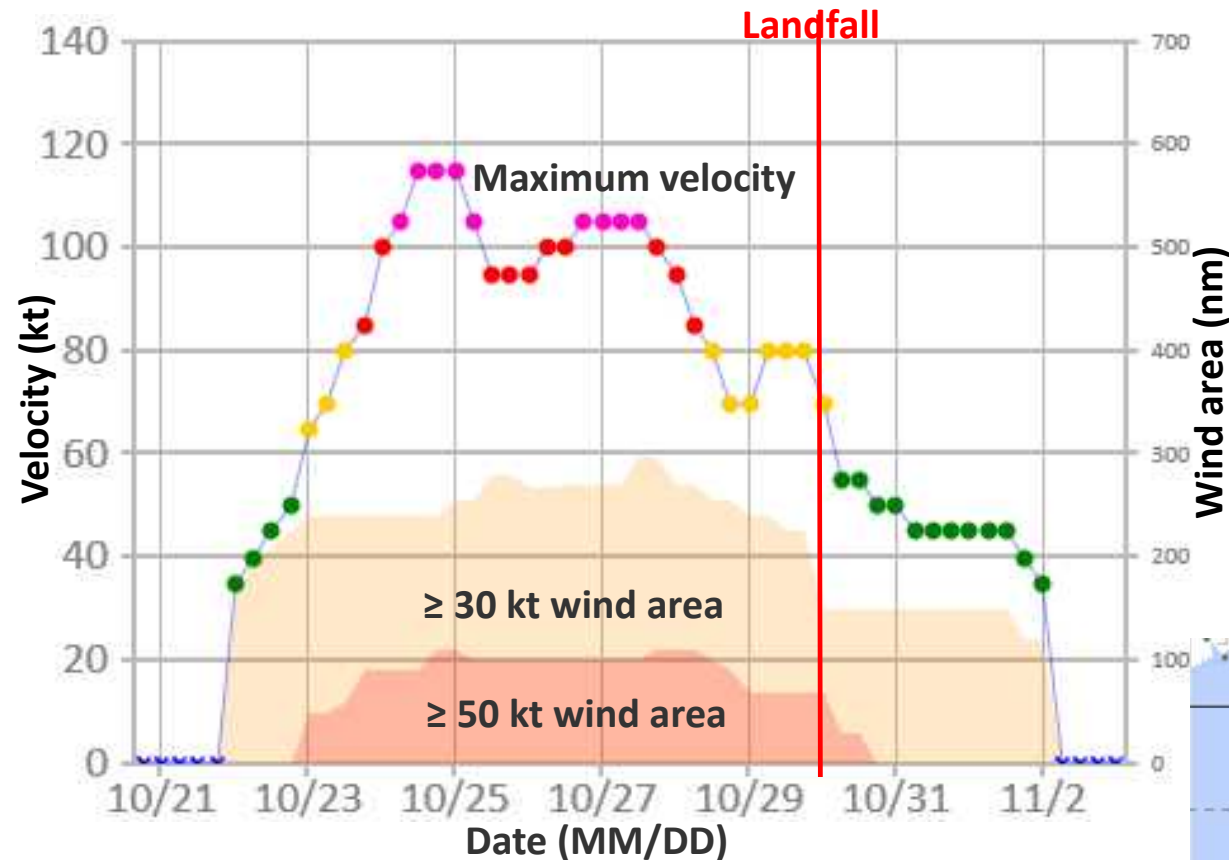
Track and atmospheric conditions

- Yutu could not move northward due to strong Pacific throughout the period.

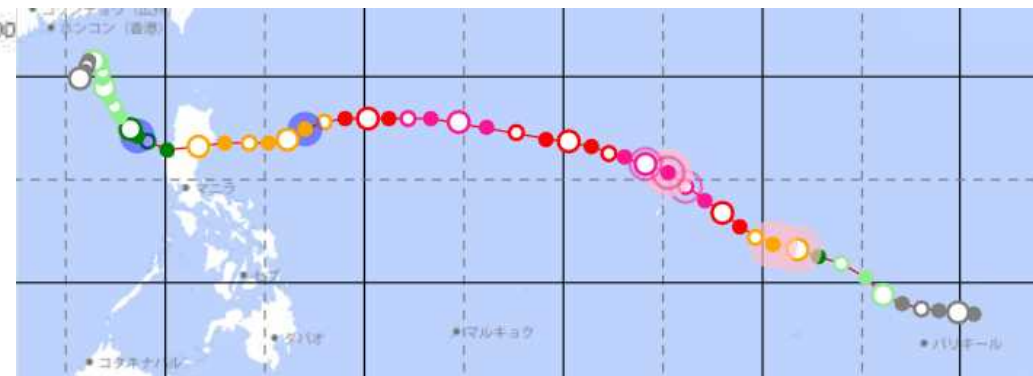
Geopotential height at 500hPa (color) and relative vorticity at 850 hPa(contour ($\geq 3.0 \times 10^{-5} \text{ s}^{-1}$)) 20 Oct.-2 Nov. 2018



Intensity changes



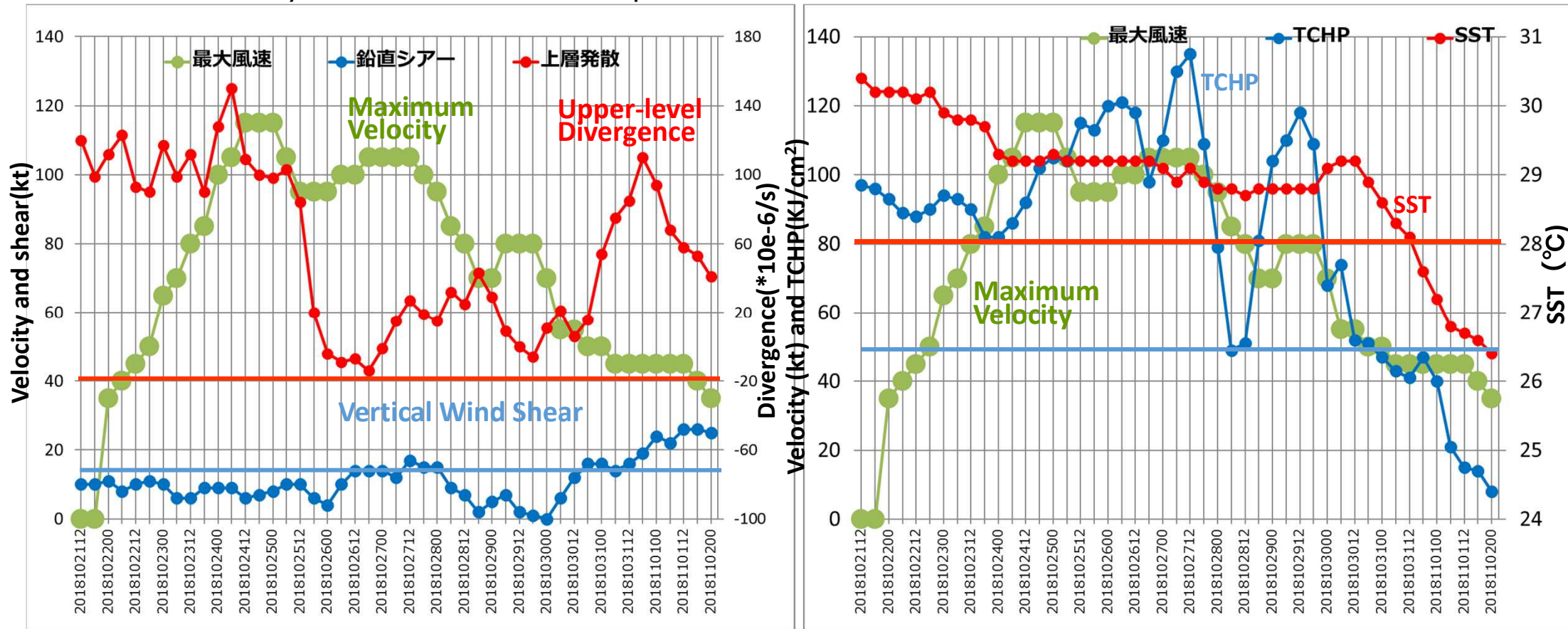
- As a result of rapid intensification such as the maximum velocity increased by 80 kt in 60 hours at the beginning of the occurrence, the peak intensity reached 115 kt and 900 hPa.
- After the weakening to 95kt, it developed again to 105kt.
- After that, the weakness and re-development were repeated twice.



Atmospheric and ocean conditions

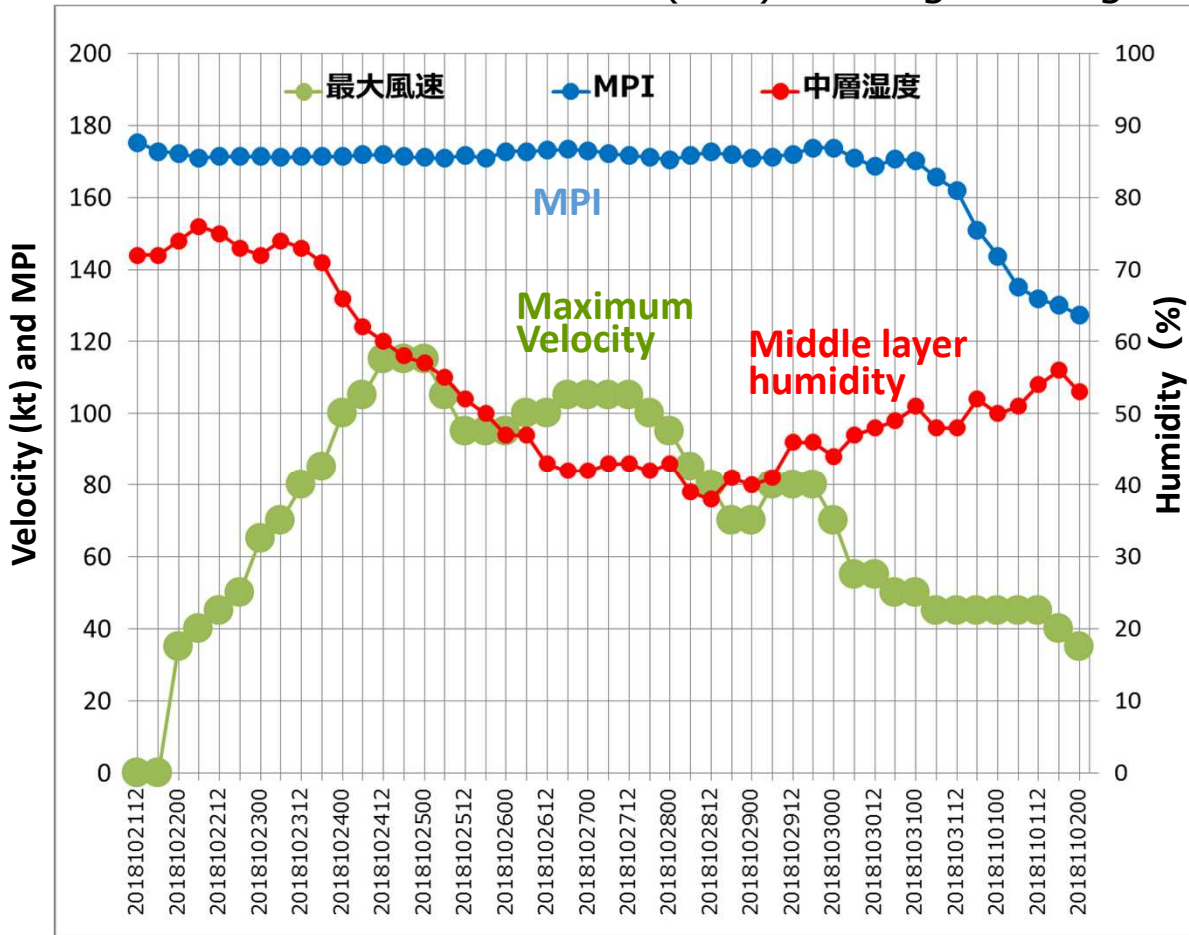
- Upper-level divergence was suitable for the development of tropical cyclones throughout the period, and vertical shear was also suitable mainly in the first half of the period.

- Both SST and TCHP were suitable for the development of tropical cyclones except for the end stage.

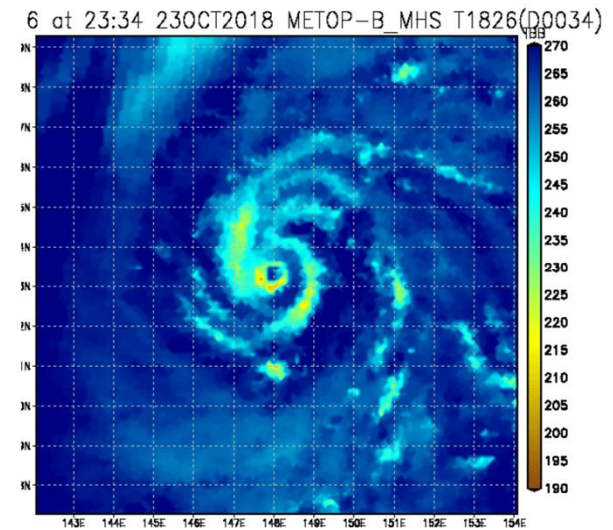
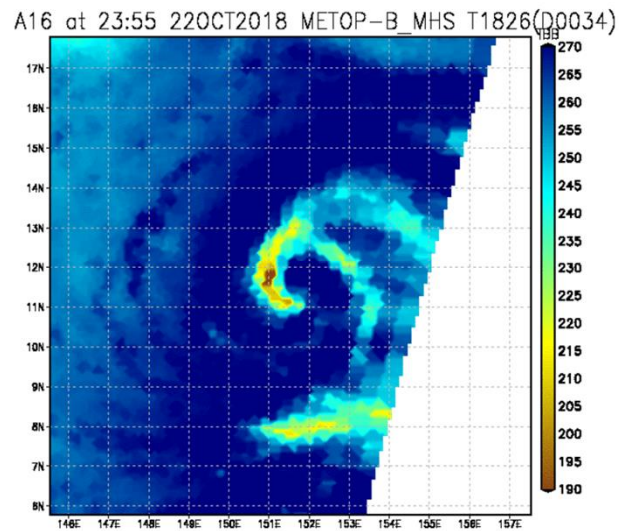
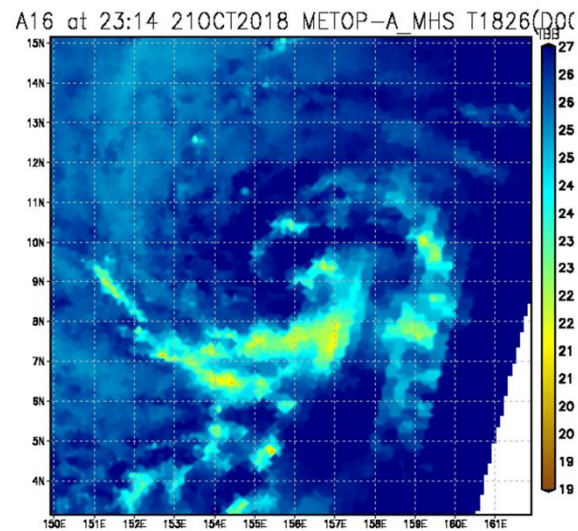
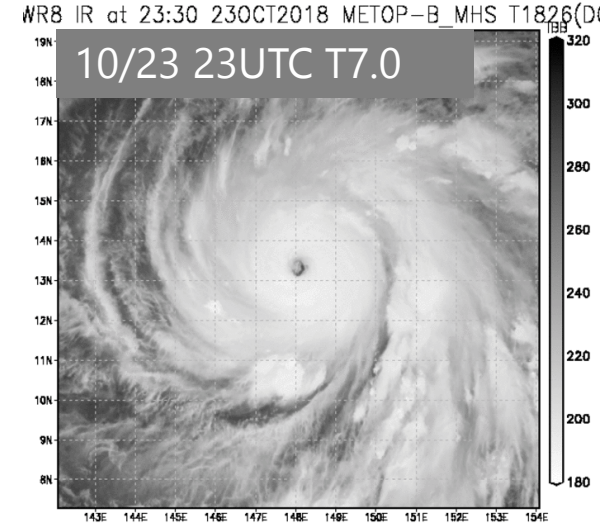
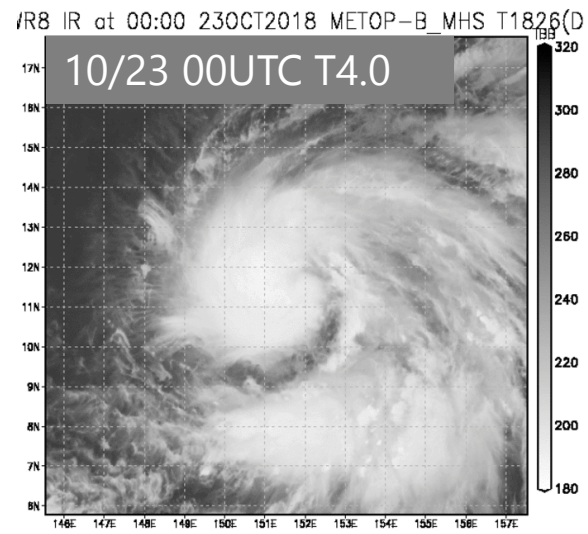
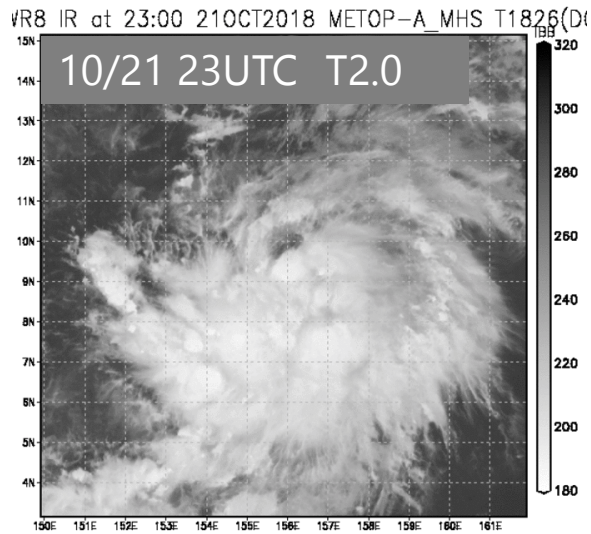


Atmospheric and ocean conditions

- The middle layer humidity during a period of rapid intensification was high. Maximum Potential Index (MPI) was high throughout the period.



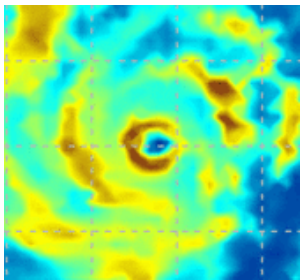
Features of rapid intensification at the beginning of the occurrence



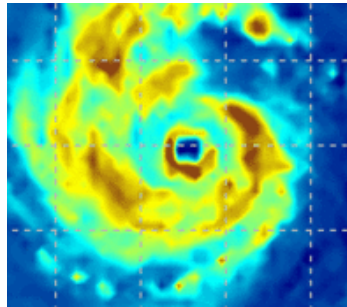
Features of 1st weakening

The eastern part of wall cloud became thinner. It seems to have been influenced by the middle-level dry air.

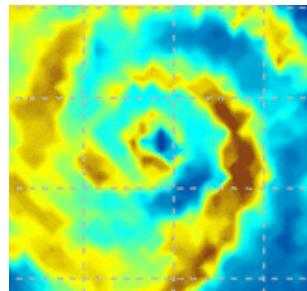
10/24 07:22UTC
T7.5



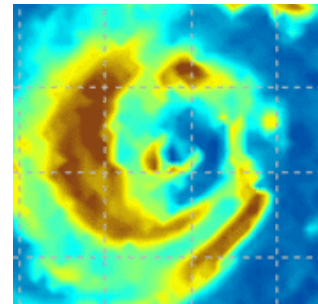
10/24 16:07UTC
T7.5⇒7.0



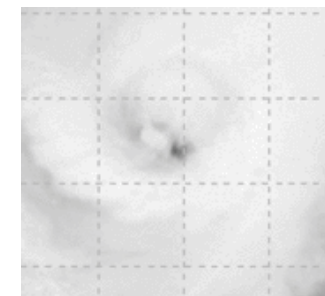
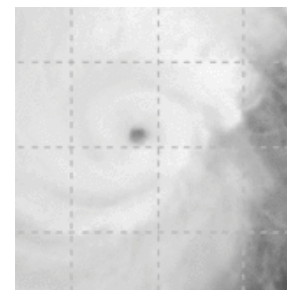
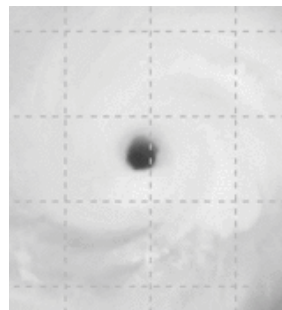
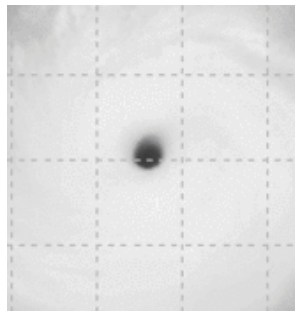
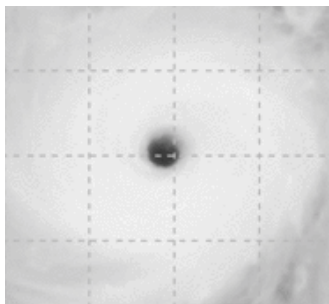
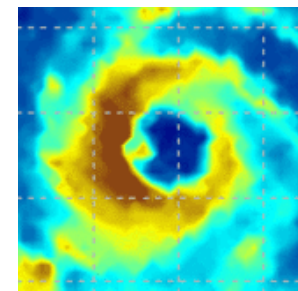
10/24 19:58UTC
T7.0⇒6.5



10/25 09:01UTC
T6.0⇒5.0



10/25 21:36UTC
T5.0⇒5.5

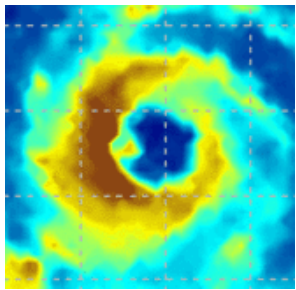


T number indicates the closest time value of the best track.

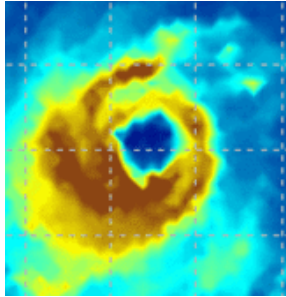
Features of re-development and second weakening

In the second weakening, the eastern part of wall cloud became thinner.
It also seems to have been influenced by the middle-level dry air.

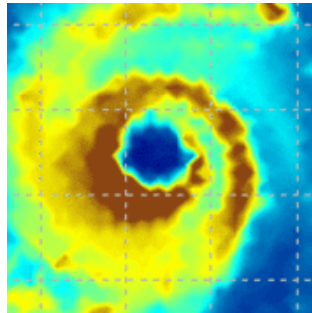
10/25 21:36UTC
T5.0⇒5.5



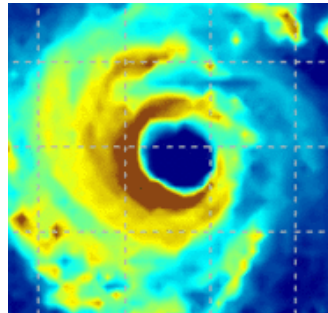
10/26 8:40UTC
T6.5⇒6.0



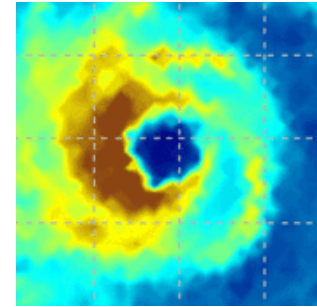
10/26 21:14UTC
T7.0⇒6.5



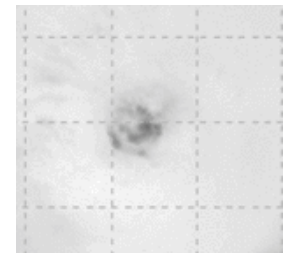
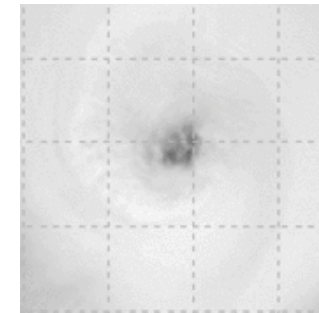
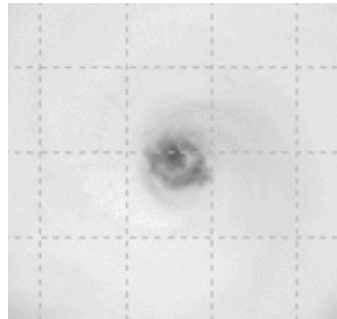
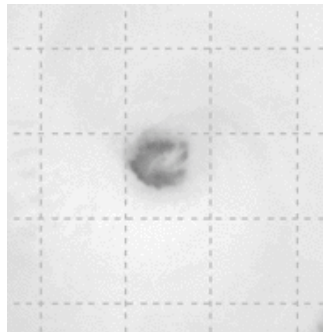
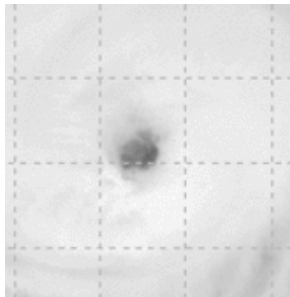
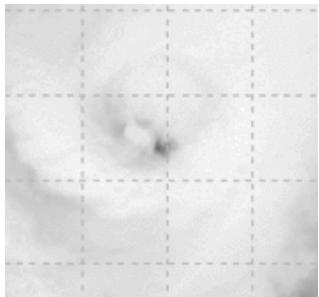
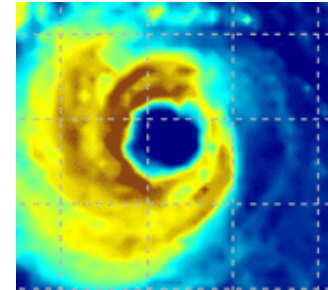
10/27 4:26UTC
T6.5



10/27 8:28UTC
T6.5

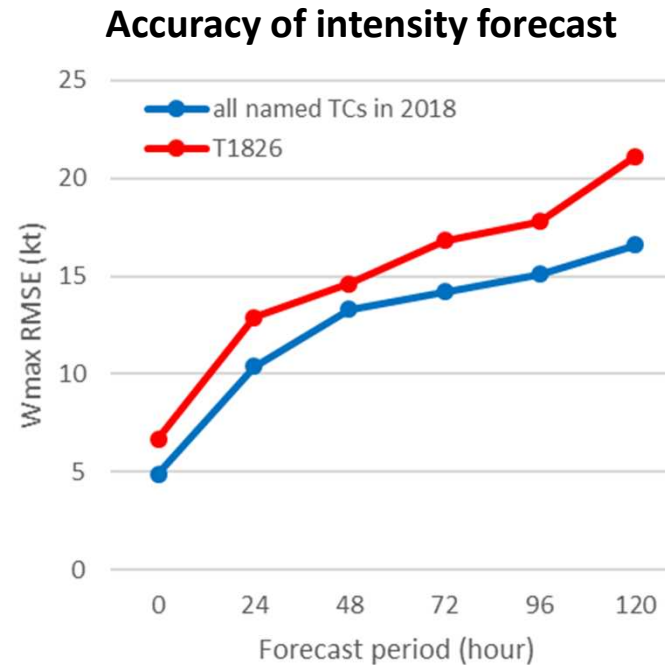
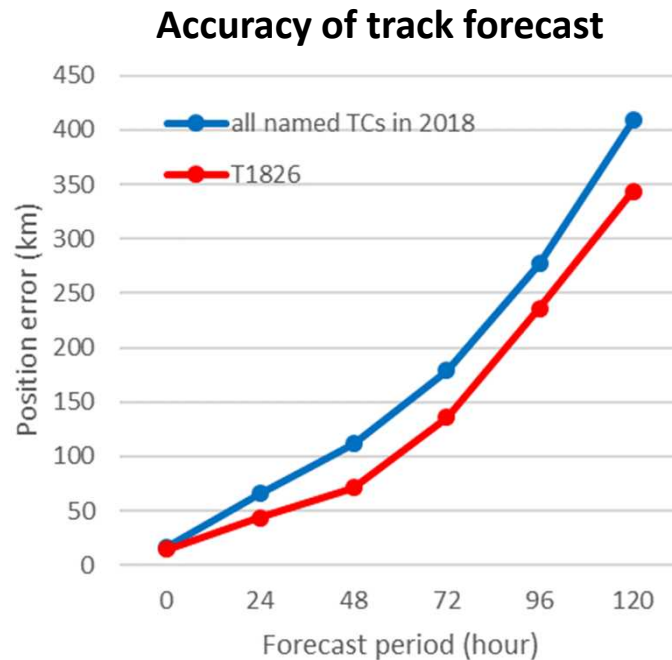


10/27 16:38UTC
T6.5⇒6.0



Track and Intensity forecast

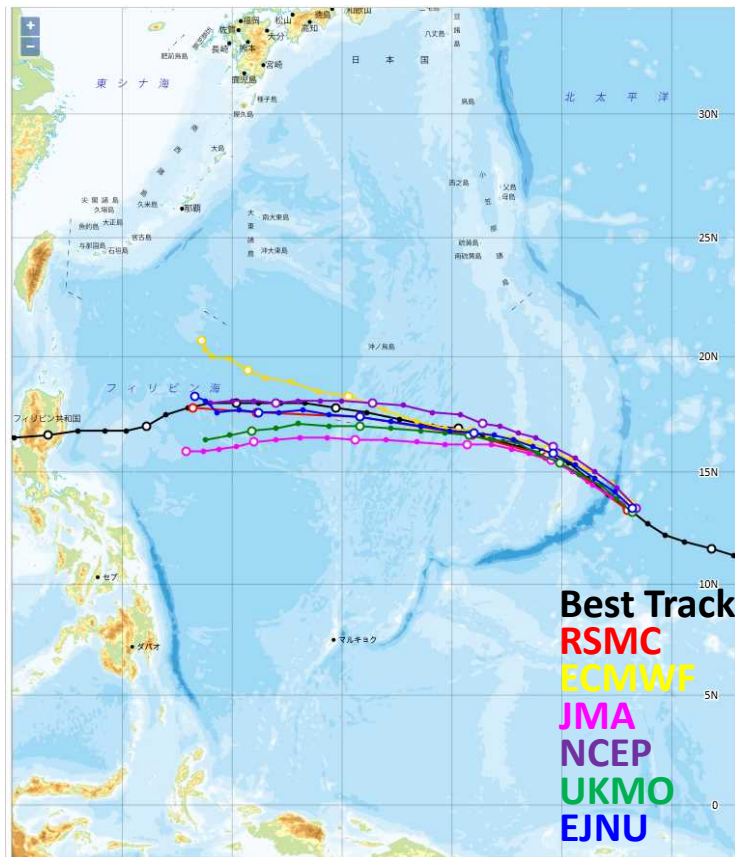
- Accuracy of track forecast for Yutu was higher than the average forecast accuracy of all named TCs in 2018.
- However, that of intensity forecast was lower, because we could not fully predict the rapid intensification and repeated development and weakening.



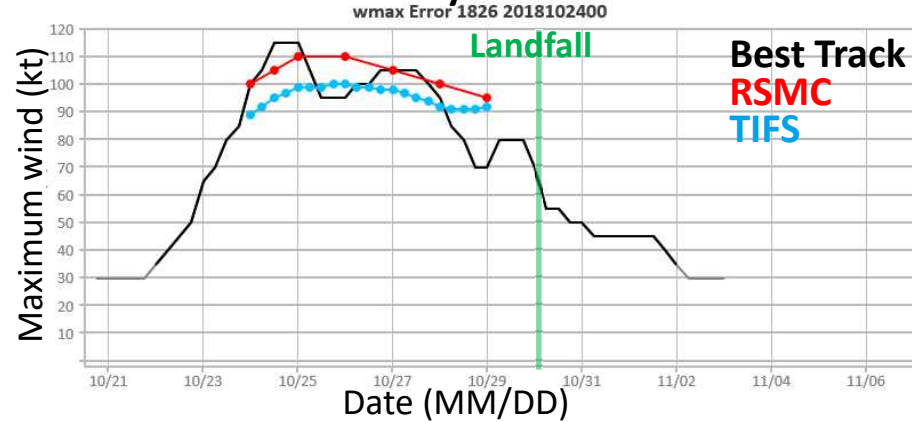
Forecast on rapid intensification

2018/10/24/00UTC

Track forecast



Intensity forecast

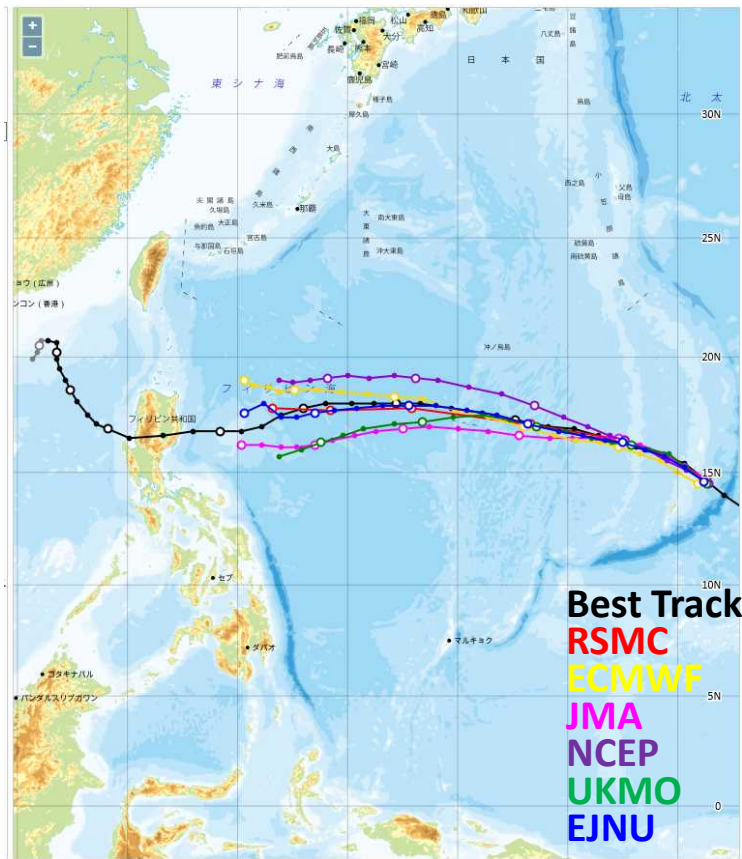


- The intensity forecast guidance TIFS was not able to follow the rapid development in analysis and could not fully predict the subsequent rapid intensification and the following intensity change.
- In the RSMC forecast, as a result of raising the intensity predicted by TIFS according to the intensity in analysis, the peak intensity could be forecasted roughly, but the trend of intensity change could not be fully forecasted.

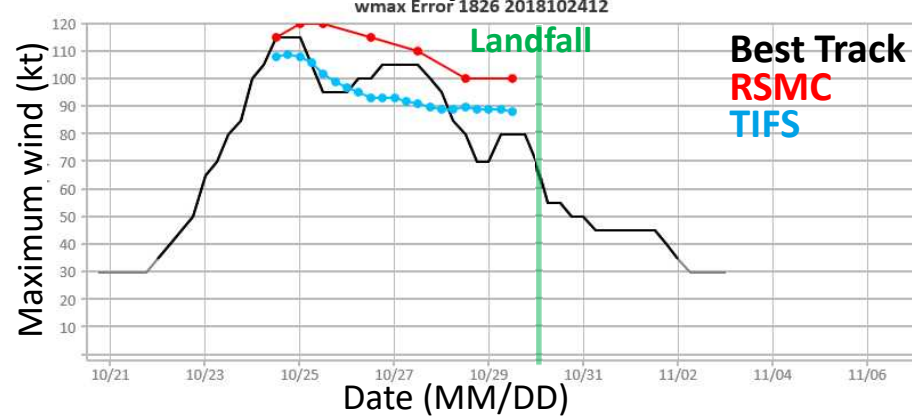
Forecast on 1st weakening

2018/10/24/12UTC

Track forecast



Intensity forecast

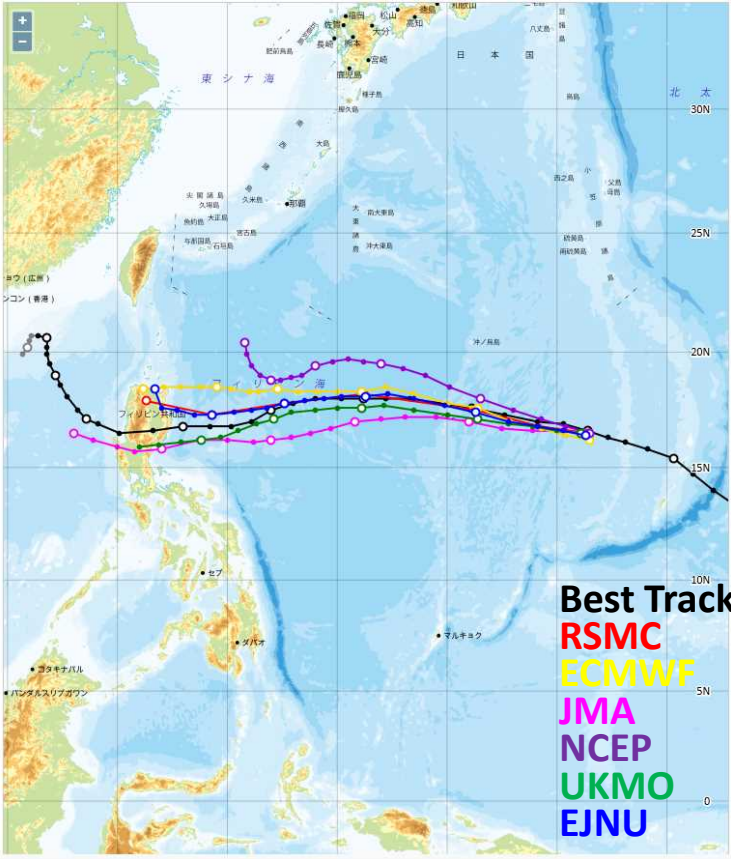


- TIFS was not able to catch up the rapid intensification in the analysis continuously, but predicted the subsequent weakening trend.
- The RSMC forecast did not adopt the TIFS forecast that could not catch up the intensity of analysis, and as a result, the forecast was for further development.

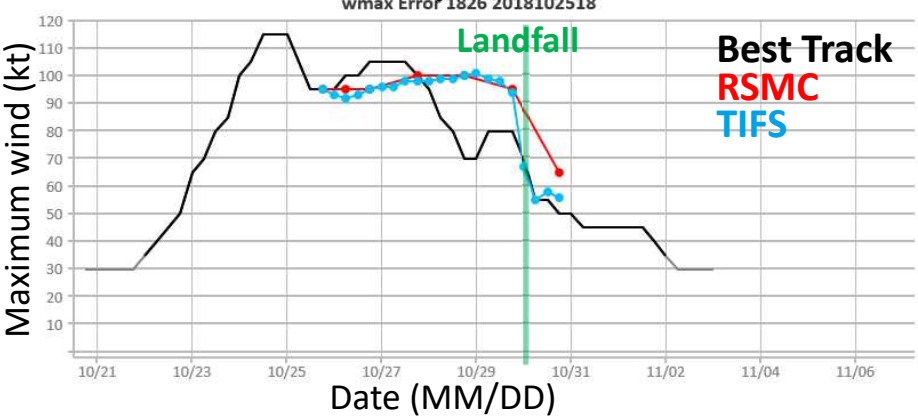
Forecast on re-development

2018/10/25/18UTC

Track forecast



Intensity forecast

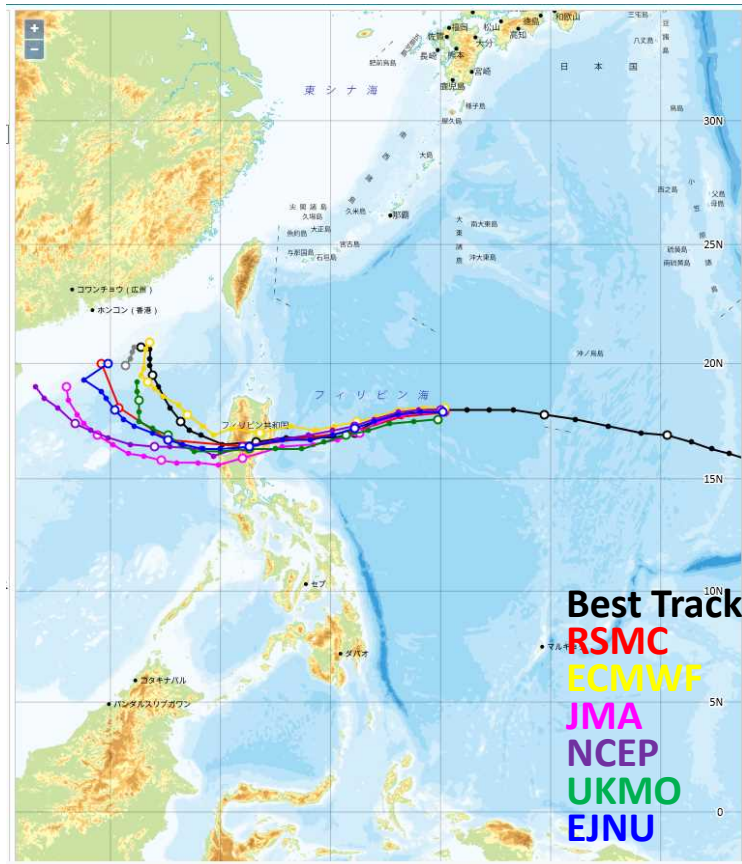


- TIFS could not predict re-development well and could not predict subsequent weakening.
- As a result of adopting TIFS, the RSMC forecast has almost same value and tendency as the TIFS prediction.

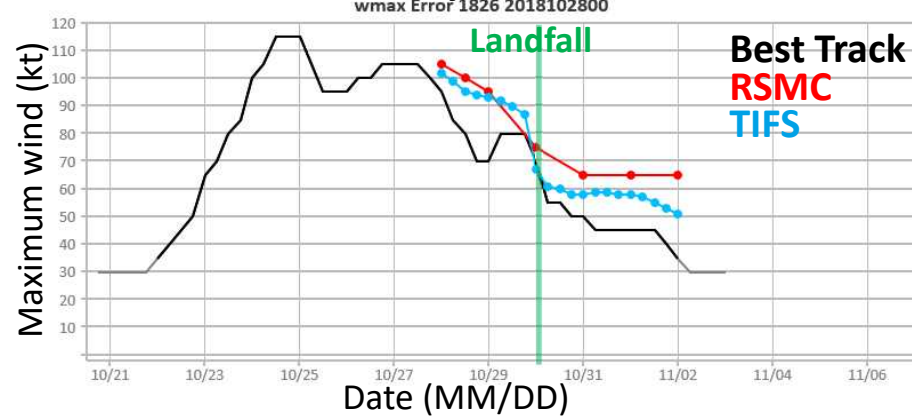
Forecast on 2nd weakening

2018/10/28/00UTC

Track forecast



Intensity forecast



- The TIFS prediction showed a weakening trend, but it were not able to make sufficient quantitative prediction.
- As a result of adopting TIFS, the RSMC forecast has almost same value and tendency as the TIFS prediction.